

# Reoperation after microdiscectomy of lumbar herniation: Case report



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## ABSTRACT

**INTRODUCTION:** Annuloplasty is the modern pathogenetically substantiated surgical technique for managing lumbar disc herniation that improves the outcomes of limited microdiscectomy. Nevertheless, the rare complications require using a special strategy for managing and customizing treatment and reoperation.

**PRESENTATION OF CASE:** We present a clinical case of a patient with transpedicular and interbody fixation reoperation after annuloplasty with Barricaid closure device. The aim of this article is to demonstrate the opportunities of surgical treatment of patients with lumbar disc herniation involving annuloplasty using the Barricaid closure device as the final stage and the ways to resolve possible complications requiring reoperation.

**DISCUSSION:** Searching for the most effective methods for preventing recurrent disc herniation is far from being completed; the need for improving methods and techniques of surgical treatment of this pathology is still topical. Reconstruction of the fibrous ring defect is currently one of the promising areas in preventing recurrent lumbar disc herniation.

**CONCLUSION:** Elimination of rare complications that have emerged after using the Barricaid annular closure device and require reoperation is possible and has satisfactory outcome.

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## 1. Introduction

Lumbar discectomy is the most common elective surgery for degenerative lumbar spine lesions. The rates of good and excellent outcomes are as high as 90–95% [1]. However, patients' satisfaction one year after the surgery amounts to about 75% [2]. Approximately 19% of patients are subject to revision surgery by the 9th year after primary discectomy [3,4]. Along with iatrogeny, the reasons for reoperations include recurrent disc herniation, segmental instability, and degenerative stenosis [5], the pathogenetic mechanism of which is based on continued degeneration of the affected intervertebral disc and facet joints. In their attempts to avoid a strong impact during microdiscectomy, surgeons use minimally invasive and limited techniques. However, despite the reduction in the injury rate and excellent immediate clinical outcomes, the rate of revision surgery is comparable to that of conventional surgery in the long-term period.

Annuloplasty is a modern pathogenetically substantiated surgical technique that improves the outcomes of limited microdiscectomy. The concept of annuloplasty is based on a number of favorable factors: preserving the intervertebral disc height, preventing recurrent disc herniation based on the barrier function,

reducing lumbodinia due to conservative microdiscectomy, and slowing down the degenerative cascade of both the intervertebral disc and facet joints of the segment [6,7]. Barricaid implant is one of the devices used to close the fibrous ring defect.

The Neurosurgical Department #2 of the Tsiv'yan Novosibirsk Research Institute of Traumatology and Orthopedics has an experience of using this prosthesis in 42 patients with the follow-up period ranging from 3 to 36 months. This article presents the only case out of the entire group of patients that had an unsatisfactory outcome and required revision surgery. Thus, the rate of unsatisfactory outcomes in our study was 2.4%. The purpose of this article is to demonstrate the potential of reoperation to resolve the complication in patients with lumbar disc herniation after Barricaid implant surgery.

## 2. Clinical case

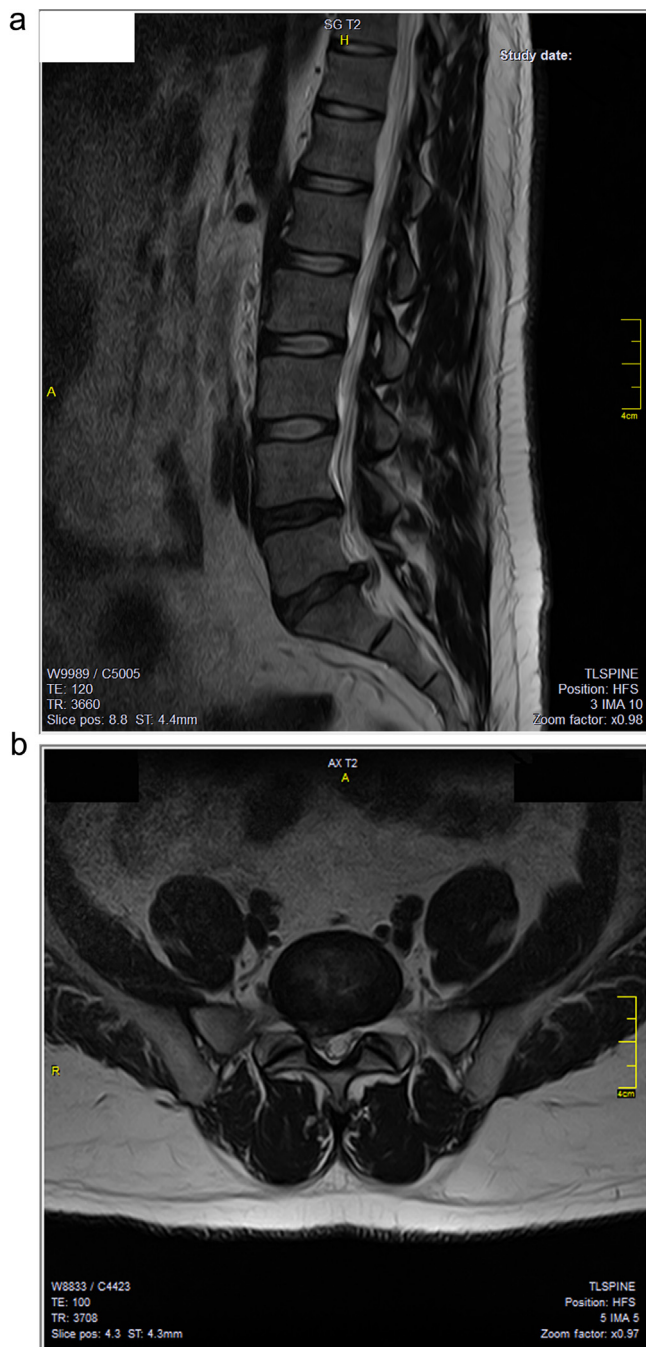
A 33-year-old male patient L. was admitted to the hospital with complaints of pain in the right gluteal region and along the posterior surface of his right thigh and leg.

According to the past medical history, acute pain in the right lower extremity appeared after heavy physical load 2 months before hospital admission. The patient received conservative treatment with no positive effect. He underwent MRI of the lumbar spine that revealed right-sided L5–S1 disc herniation. Given the lack of

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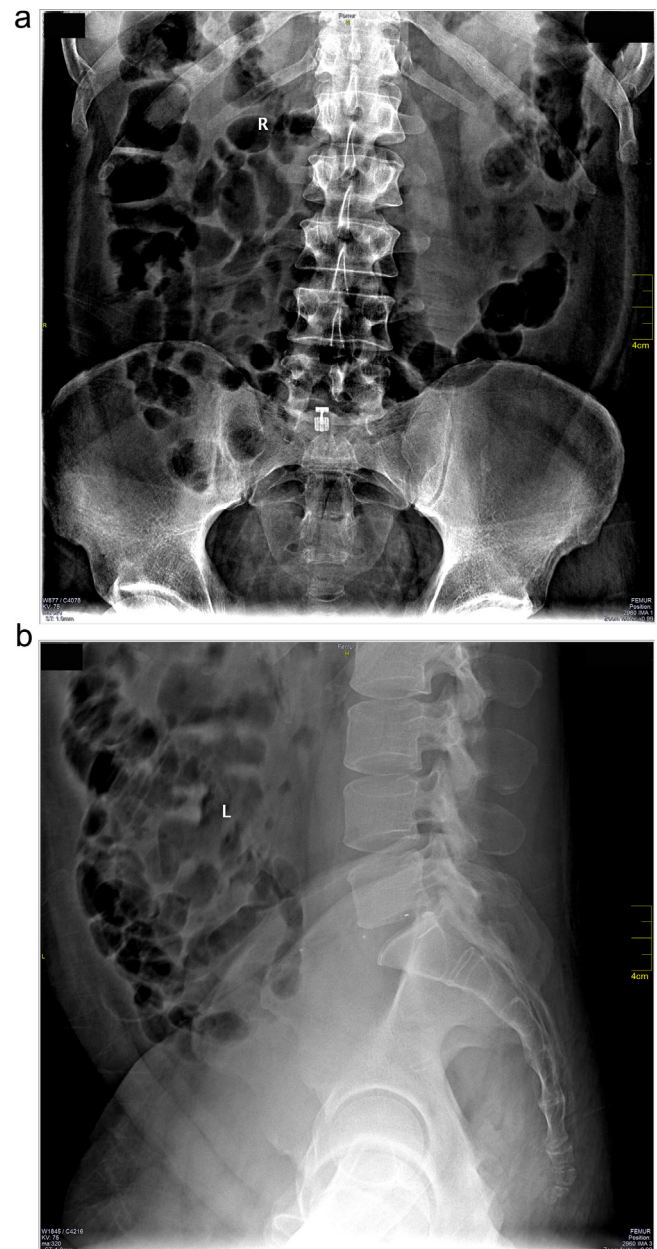
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**Fig. 1.** Preoperative MRI scans of the lumbar spine demonstrating the right-sided paramedian herniation of the L5–S1 intervertebral disc: a – sagittal view, b – axial view.

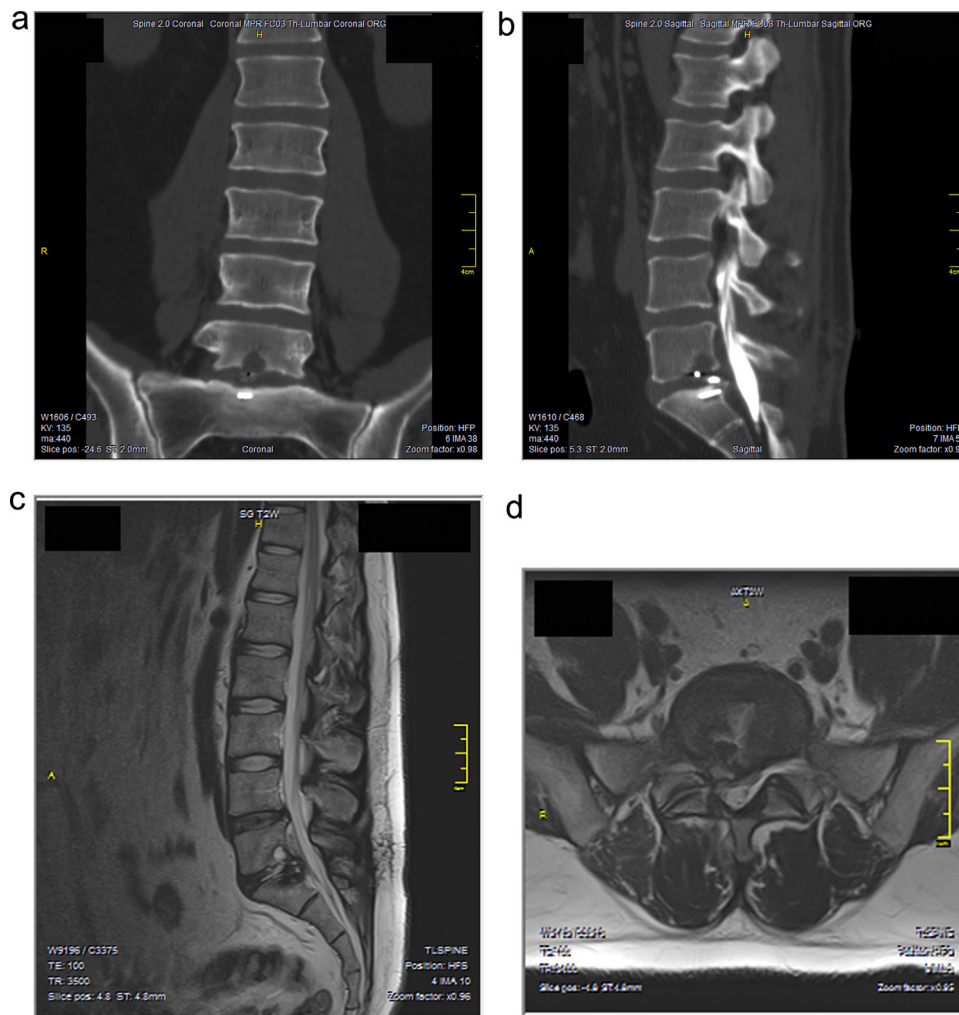
effect of conservative treatment, the patient was admitted to the Department for surgical treatment.

**Neurological status.** Upper and lower limb strength was sufficient. The arm reflexes were equal and brisk; the abdominal reflexes were equal and brisk; the knee reflexes were S = D; the Achilles and plantar reflexes were D < S; hypoesthesia in the S1 dermatome area on the right side; Lasegue's sign (45°) on the right side. The pelvic functions were normal. The pain syndrome intensity was assessed using the visual analog scale (VAS): the score corresponding to pain in the lower extremity was 7, and the score corresponding to pain in the lumbar spine was 1. The Oswestry Disability Index (ODI) was 54%.



**Fig. 2.** Postoperative X-rays of the lumbar spine: a – anteroposterior view, b – lateral view. The Barricaid annular closure device is visualized at the L5–S1 level of the functional spinal unit; its anchor is impacted into the S1 vertebral body, while the mesh tightly contacts the hyaline cartilage endplate of the L5 vertebral body.

Additional examination was performed at the Department and involved MRI of the lumbar spine and lumbar spine spondylography in frontal and lateral projections, complemented by functional radiography. The examination confirmed the presence of a *pathomorphological substrate*: the right-sided L5–S1 disc herniation. According to the grading system proposed by Pfirrmann, intervertebral disc degeneration corresponded to Grade III; spondylarthrosis corresponded to Grade 1–2 according to the Grogan classification; the intervertebral disc height in the dorsal portion was 6 mm; neither anomalies of the lumbosacral joint nor signs of segmental instability were detected (Fig. 1a, b). The patient was diagnosed with lumbar osteochondrosis with a primary lesion of the L5–S1 segment, right-sided L5–S1 disc herniation, and right-sided compression ischemic S1 radiculopathy.



**Fig. 3.** MRI (a, b) and MSCT (c, d) scans of the lumbar spine 1.5 months after surgery. The scans show bone resorption around the implant anchor (in the S1 vertebral body) and the mesh (in the L5 vertebral body) and inflammatory changes in the adjacent tissues.

The patient underwent surgery that involved interlaminectomy at the L5–S1 level on the right side, removal of the herniated disc, and reconstruction of the fibrous ring defect with the Barricaid annular closure device. Surgery was performed under general anesthesia in the knee-chest position. After control radiography to mark the level, a straight-line incision of soft tissues along the spinous processes in the projection of the desired disc was made. A common type of unilateral interlaminectomy was performed using a microscope (magnification of  $\times 2.2$ – $4.4$ ). The root and dural sac were displaced from the disc herniation. The hernial fragment was removed via sequestrectomy, the intradiscal portion of the nucleus pulposus remaining intact.

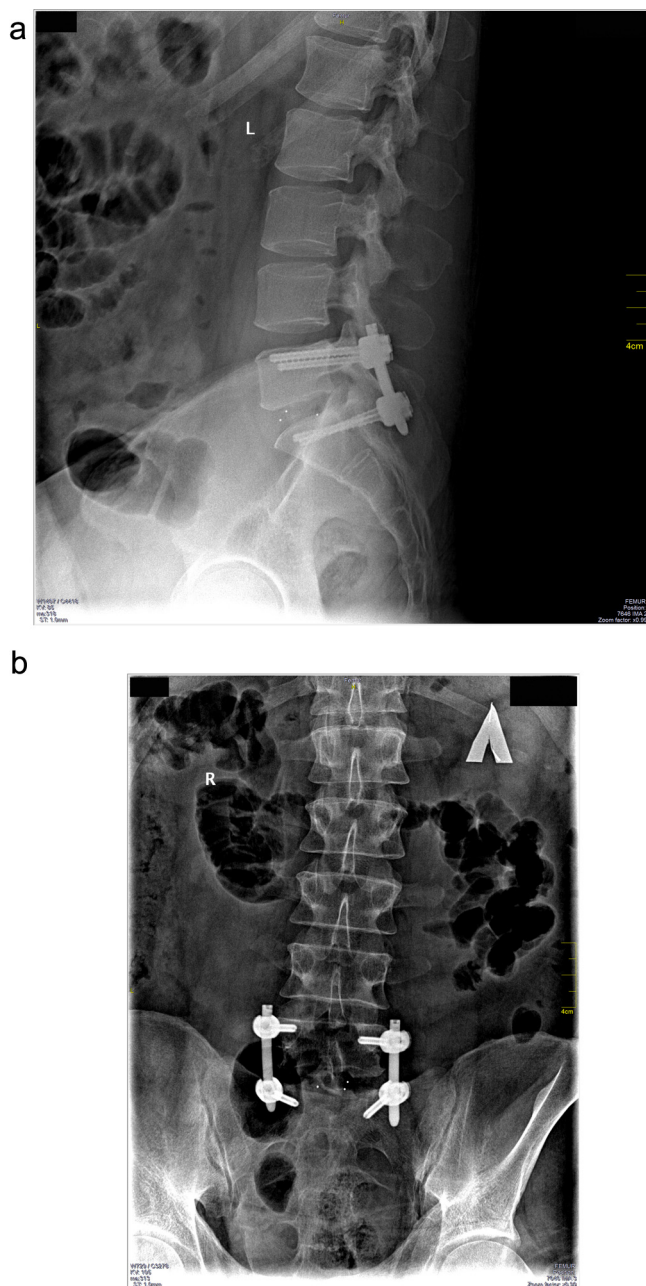
Next, the size of the fibrous ring defect was determined according to the protocol for Barricaid insertion. The projection plane of the endplate of the upper- or lower-lying vertebra was identified under control of an image intensifier. A probe tool was used to determine the correct direction for implant insertion (parallel to the posterior portion of the endplate, the angle being sufficient for placing the implant; the anchor tightly contacting the postero-superior angle of the vertebral body). The annular closure device was impacted into the vertebral body with a holder under control of an image intensifier so that the posterior portion of the device lay 1 mm deeper than the plane of the posterior wall of the vertebral body. Control radiography was performed after the holder

had been removed. Hemostasis was assured. The wound was closed layerwise. Iodine and an aseptic bandage were applied.

The patient was allowed to get out of bed on the day of surgery; wound pain was the only disturbance to him. Postoperative control X-rays (Fig. 2a, b) demonstrated the implant shadow located directly in the L5–S1 intervertebral space. The patient was discharged in satisfactory condition on day 4. Upon discharge, the VAS score for pain in the lower extremity was 0 and the VAS score for pain in the lumbar spine was 2.

One month after discharge, the patient noted aggravation of pain in the lumbar spine and the right lower extremity. Ambulatory conservative therapy for 2 weeks had no positive effect. The patient was hospitalized to the Department. MRI and MSCT scans of the lumbar spine were recorded (Fig. 3a–d). Examination revealed bone resorption around the implant and signs of inflammatory changes in the adjacent tissues. Laboratory analysis revealed no increase in acute-phase response indicators. Taking into account the clinical data, the data obtained by instrumented methods, and resistance to conservative therapy, the patient underwent revision surgery. No signs of purulent inflammation around the implant were found intraoperatively. The implant resided at a typical site but could be easily displaced. The adjacent tissue was harvested for bacteriological examination. The revealed changes were regarded as aseptic loosening of the implant. A decision was made to remove the implant and perform transpedicular and interbody fixation of





**Fig. 4.** X-rays of the lumbar spine in the anteroposterior (a) and lateral (b) views after the Barricaid annular closure device was removed and 360° spinal fusion was achieved at the L5–S1 level of the functional spinal unit.

the functional spinal unit (Fig. 4a, b). The bacteriological culture of peri-implant tissues revealed no growth of the microflora. The patient was able to get up on his own on the first day after surgery. The wounds healed by primary intention. On day 7, the patient was discharged for outpatient treatment. At discharge, the VAS scores of pain in the lower extremity and pain in the lumbar spine were 0 and 4, respectively. At control examination after 4 months, the patient complained of moderate pain in the lumbar spine that did not require administration of anesthetics. The VAS score evaluated by patient was 0 for pain intensity in the lower extremity and 2 for pain in the lumbar spine. The Oswestry Disability Index was 18%. MSCT of the lumbar spine demonstrated that the transpedicular construct and the interbody implant were properly arranged; no resorption areas were detected. Patient's condition remained sta-

ble within the subsequent 9 months: he had no complaints and experienced no pain.

### 3. Discussion

We have demonstrated that surgical treatment can be performed in case of instability of the Barricaid annular closure device requiring reoperation. However, randomized multicenter studies are needed to justify the choice of the method that would be optimal and most effective.

Advances in surgical instrumentation and the introduction of minimally invasive microsurgical techniques for disc herniation removal have only made it possible to reduce the rate of hernia recurrence, but not to completely eliminate herniation. The question associated with the degree of surgery aggressiveness in treating patients with lumbar disc herniation is yet to be solved, since every surgical technique has its negative aspects. In order to reduce the recurrence rate and preserve the anatomical integrity of the disc, a device for closing the fibrous ring defect after limited microdiscectomy has been proposed. This technique ensures preservation of the intervertebral disc height, prevents disc herniation recurrence based on the barrier function, decreases lumbodysnia due to conservative microdiscectomy, and slows down the degenerative cascade of both the intervertebral disc and facet joints of the segment.

The outcomes of surgical treatment in patients with lumbar discs herniation using the Barricaid annular closure device have been analyzed in a number of studies. Lequin et al. conducted a prospective study in 45 patients who had undergone limited discectomy at the L4–L5 and L5–S1 levels. The authors observed a statistically significant decrease in pain intensity (VAS) and an improvement in the quality of life (the Oswestry Disability Index). The intervertebral disc height was preserved in 93% of cases. Revision surgery was required in three cases: in one case, for recurrent disc herniation; in the second case, for contralateral recurrent disc herniation, and in the third case, for gross epidural scar changes [8]. In their two-year follow-up study, Parker et al. compared the outcomes of conventional microdiscectomy and discectomy using the Barricaid device. As opposed to our experience, the authors did not identify any cases requiring revision surgery in the annuloplasty group in contrast to the discectomy group where reoperation was performed in 6.5% of cases. They also noted greater preservation of the disc height, lower pain intensity, and the lower Oswestry Disability Index in the Barricaid group [6]. Bouma et al. also reported on 1.4% of symptomatic recurrent disc herniation and 1.5% of asymptomatic herniation. Trummer et al. demonstrated that annuloplasty slows down degeneration of the facet joints [9]. Therefore, despite possible complications after microdiscectomy using the Barricaid annular closure device, according to the literature data, their rate is lower than that after conventional discectomy.

Searching for the most effective methods for preventing recurrent disc herniation is far from being complete and the need for improving methods and techniques of surgical treatment of this pathology still remains topical. Today, reconstruction of the fibrous ring defect is one of promising areas in preventing recurrence of lumbar disc herniation. However, practitioners should take into account all the possible benefits and the potential complications of using annular closure devices. The aforesaid surgical strategy contributes to the development of general management of patients with lumbar disc herniation. Follow up of patient's condition and the positive dynamics of the symptoms during 13 months after reoperation allow for the conclusion how safe and effective the selected treatment strategy is.

#### 4. Conclusion

Although annuloplasty using the Barricaid annular closure device reduces the rate of recurrent disc herniation, there is a risk that aseptic instability may develop, which can be successfully overcome through reoperation. The personalized approach to patients and adequate selection of surgical treatment improve the long-term clinical outcomes in patients with lumbar disc herniation.

#### Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

#### Conflict of interests

The authors have no conflict of interests to declare. Intrinsic Therapeutics provided support for the clinical research and data analysis.

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